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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/524,038	02/09/2005	Kiyotaka Ishibashi	265770US26PCT	4852

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OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C.
1940 DUKE STREET
ALEXANDRIA, VA 22314

EXAMINER	
DHINGRA, RAKESH KUMAR	

ART UNIT	PAPER NUMBER
1792	

NOTIFICATION DATE	DELIVERY MODE
12/31/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@oblon.com
oblonpat@oblon.com
jgardner@oblon.com

Office Action Summary	Application No.	Applicant(s)	
	10/524,038	ISHIBASHI ET AL.	
	Examiner	Art Unit	
	Rakesh K. Dhingra	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 October 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,5-11,13-15 and 17-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,5-11,13-15 and 17-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 October 2007* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1) The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1, 5, 7, 11, 17, 18, 19, 21 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

a) Amended claims 1, 11 (for example) recite "a first chamber for accommodating therein the substrate" and "a second chamber including of a dielectric top plate unit, the second chamber being disposed on an upper portion of the first chamber" wherein the limitation "second chamber including of a dielectric top plate unit, the second chamber being disposed on an upper portion of the first chamber" is considered as indefinite. Claim limitation implies that the apparatus comprises of two chambers wherein a first chamber accommodates a substrate, and the second chamber includes a dielectric top plate unit, and is disposed on an upper portion of the first chamber, which limitations are not disclosed as such by the applicant's specification Fig. 1-3 and page 9, line 25 to page 14, line 5). It is presumed that applicant has considered the top plate 4 as the second chamber, whereas as per specification (page 2, lines 12-14), the top plate unit 4 serves

as a part of a partition wall of the chamber 1 and disposed in an upper part of chamber 1. Additionally the amended claim limitation "second chamber including of a dielectric top plate unit, the second chamber being disposed on an upper portion of the first chamber" implies as if the second chamber includes a dielectric top plate unit, besides some other unclaimed parts, whereas presuming that the applicant has considered the top plate 4 as the second chamber, then there is nothing more in the second chamber except the dielectric top plate unit 4 itself. Applicant need to clearly identify with reference to specification and drawings, the structures which are recited as the first chamber and the second chamber in the now amended claims 1, 11.

2) The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1, 5, 7, 11, 17, 18, 19, 21 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention as explained hereunder.

Amended claims 1, 11 recite in part, "a first chamber for accommodating therein the substrate" and "a second chamber including of a dielectric top plate unit, the second chamber being disposed on an upper portion of the first chamber" which are considered as indefinite. Claim limitations imply that the apparatus comprises of two chambers, and wherein the second chamber includes a dielectric top plate unit, and is disposed on an upper portion of the first chamber, which are not disclosed as such by the applicant's specification (Fig. 1-3 and page 9, line 25 to page 14, line 5). It is presumed that applicant has considered the top plate 4 as a second chamber, whereas as per specification (page 2, lines 12-14), the top plate unit 4 serves as a part of a partition wall of the chamber 1 and disposed in an upper part of chamber 1. Additionally the

amended claim limitation "second chamber including of a dielectric top plate unit, the second chamber being disposed on an upper portion of the first chamber" implies as if the second chamber includes a dielectric top plate unit, besides some other unclaimed parts, whereas presuming that the applicant has considered the top plate 4 as the second chamber, then there is nothing more in the second chamber except the dielectric top plate unit 4 itself. Therefore for the purpose of examination on merits these limitations have been interpreted as "a chamber for accommodating therein the substrate" and "a dielectric top plate unit, disposed in an upper portion of the chamber"

In view of above, limitations in following claims have also been interpreted as indicated against each:

Claim 5 : Claim limitation "for supplying a gas into the first chamber" has been interpreted as "for supplying a gas into the chamber";

Claim 7: Claim limitation "an inner shape of the second chamber" is interpreted as "an inner shape of the dielectric top plate unit";

Claim 17: Claim limitation "a portion of the second chamber" is interpreted as "a portion of the dielectric top plate unit";

Claim 18: Claim limitation "an inner shape of the second chamber" is interpreted as "an inner shape of the dielectric top plate unit";

Claim 19: Claim limitation "for supplying a gas into the first chamber" has been interpreted as "for supplying a gas into the chamber";

Claim 21: Claim limitation "a portion of the second chamber" is interpreted as "a portion of the dielectric top plate unit".

Applicant is invited to clarify/amend the claims.

Claims 6, 9, 10, 13-15, 20 and 22 are also rejected being dependent claims.

Response to Arguments

Applicant's arguments with respect to claims 1-20 have been considered but are moot in view of the new ground(s) of rejection as explained hereunder.

Applicant has amended claims 1, 5-11, 13-15 and 17-20 by adding new limitation (for example in claim 1 new limitation "a second chamber including of a dielectric top plate unit, the second chamber being disposed on an upper portion of the first chamber; and

an antenna unit" having a plurality of slots for irradiating a microwave towards an inside of the first chamber through the top plate unit, the antenna being disposed on the second chamber" etc have been added). Further, applicant has cancelled claims 2-4, 12, 16 and added new claims 21, 22.

Claims 1, 5-11, 13-15 and 17-22 are presently pending and active.

Reference by Kazumi et al (JP 2000-331998) when combined with Chen et al reads on amended claim 1 limitations. Accordingly claims 1, 5-7, 9 and 10 have been rejected under 35 USC 103 (a) as explained below. Further, Kazumi et al (JP 2000-331998) when combined with Ishii et al reads on amended claim 11 limitations. Accordingly claims 11, 13-15 and 17-22 have also been rejected under 35 USC 103 (a) as explained below.

In view of amendments to claims 1, 11 and all the balance pending claims, the non-statutory double patenting rejections are withdrawn.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 5-7, 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kazumi et al (JP 2000-331998) in view of Chen et al (US Patent No. 5,234,526).

Regarding Claim 1: Kazumi et al teach a plasma apparatus comprising:

a chamber 20 for accommodating a substrate 27;

a dielectric top plate unit 26 disposed in an upper portion of the chamber;

an antenna 50 having a plurality of slots 50A and disposed on the top plate 23; wherein

the top plate unit 23 includes a dielectric flat plate portion and in contact with the antenna 50; and a dielectric side wall portion extending from a peripheral region portion of the flat plate portion and towards the substrate (for example, Fig. 3 and para. 0023-0026 and 0030-0035).

Kazumi et al do not teach thickness of the dielectric side wall portion.

Chen et al teach a plasma apparatus comprising a top plate unit (for example, Fig. 4, 8, 14a) with a flat plate portion and a side wall portion that extends towards a substrate. Chen et al further teach that window can also be made in two pieces like a flat plate portion 100c and a curved piece 100d (Fig. 6b). Chen et al also teach that geometry and material properties of the dielectric top plate are optimized (like result effective variables) as per requirement of microwave electric field distribution in various regions of the processing chamber and also as per required microwaves modes. Thus by selecting the thickness and dielectric material constant of the dielectric top plate 120 (for example in Fig. 14a), control of the microwave electric field amplitude in the chamber is enabled. Chen et al additionally teach that as an example (Fig. 3) for proper matching the thickness of the dielectric top plate 9 is made equal to ¼ times lambda.g, multiplied by an integer (for example, col. 8, lines 50-68 and col. 12, lines 60-68 and col. 15, line 44 to col. 16, line 25). It would be obvious to control the thickness of the side wall portion of the top plate in Kazumi's apparatus, as per teaching of Chen et al to control microwave power distribution in the process chamber.

Therefore it would have been obvious to one of ordinary skills in the art at the time of the invention to optimize the thickness of the side wall portion of the top plate as taught by Chen et al in the apparatus of Kazumi et al to obtain required microwave power distribution in the process chamber.

In this connection courts have ruled:

It would have been obvious to one having ordinary skill in the art to have determined the optimum value of a cause effective variable through routine experimentation in the absence of a showing of criticality. *In re Woodruff*, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Regarding Claim 5: Kazumi et al teach gas injection opening 29 for supplying gas into chamber along the side wall portion (Fig. 3).

Regarding Claims 6, 10: Chen et al teach that an outer periphery of side wall portion 120b is covered with a conductor 124 (metal wall of the chamber) without any gap (Fig. 14a).

Regarding Claim 7: Chen et al teach that inner shape of the dielectric top plate unit 120 is bell-jar type (Fig. 14a).

Regarding Claim 9: Kazumi et al teach a gap 25 between the side wall portion 23 and the conductor 20 (metal chamber wall) [Fig. 3 and para. 0023].

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kazumi et al (JP 2000-331998) in view of Ishii et al (US PGPUB No. 2002/0038692).

Regarding Claim 11: Kazumi et al teach all limitations of the claim (as already explained above under claim 1) except gap distance between the top plate unit and the antenna.

Ishii et al teach a plasma apparatus with a slot antenna that is disposed above a dielectric top plate with a gap there-between. Ishii et al further teach that by controlling the gap d2 between the antenna 30 and the dielectric plate 13, a radiation angle .theta. can be controlled. Ishii et al also teach that by controlling the radiation angle theta. the plasma generation due to the electromagnetic fields directly incident from the radial antenna 30 becomes dominant to permit accurate control of the plasma distribution (Fig. 1, 13, 14 and para. 0106, 0144-0147). It

would be obvious to optimize the gap between the antenna and the dielectric top plate (as a result effective variable) in the apparatus of Kazumi et al to permit accurate control of plasma distribution in the plasma chamber.

Therefore it would have been obvious to one of ordinary skills in the art at the time of the invention to optimize the gap between the antenna and the dielectric top plate in the apparatus of Kazumi et al as taught by Ishii et al in the apparatus of Kazumi et al to permit accurate control of plasma distribution in the plasma chamber.

In this connection courts have ruled:

It would have been obvious to one having ordinary skill in the art to have determined the optimum value of a cause effective variable through routine experimentation in the absence of a showing of criticality. *In re Woodruff*, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Claims 15, 13, 14 and 17-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kazumi et al (JP 2000-331998) in view of Ishii et al (US PGPUB No. 2002/0038692) as applied to claim 11 and further in view of Chen et al (US Patent No. 5,234,526).

Regarding Claim 15: Kazumi et al in view of Ishii et al teach all limitations of the claim but do not teach thickness of the sidewall portion of the top plate.

Chen et al teach a plasma apparatus comprising a top plate unit (for example, Fig. 4, 8, 14a) with a flat plate portion and a side wall portion that extends towards a substrate. Chen et al further teach that geometry and material properties of the dielectric top plate are optimized (like result effective variables) as per requirement of microwave electric field distribution in various regions of the processing chamber and also as per required microwaves modes Thus by selecting

the thickness and dielectric material constant of the dielectric top plate 120 (for example in Fig. 14a) control of the microwave electric field amplitude in the chamber is enabled. Chen et al also teach that as an example (Fig. 3) for proper matching the thickness of the dielectric top plate 9 is made equal to ¼ times lambda.g, multiplied by an integer (for example, col. 8, lines 50-68 and col. 12, lines 60-68 and col. 15, line 44 to col. 16, line 25). It would be obvious to control the thickness of the side wall portion of the top plate in Kazumi's apparatus, as per teaching of Chen et al to control microwave power distribution in the process chamber, as per requirement.

Therefore it would have been obvious to one of ordinary skills in the art at the time of the invention to optimize the thickness of the side wall portion of the top plate as taught by Chen et al in the apparatus of Kazumi et al in view of Ishii et al to obtain required microwave power distribution in the process chamber.

In this connection courts have ruled:

It would have been obvious to one having ordinary skill in the art to have determined the optimum value of a cause effective variable through routine experimentation in the absence of a showing of criticality. *In re Woodruff*, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Regarding Claims 17, 21: Chen et al teach that a portion of the dielectric top plate unit120 facing the plasma has a curved surface extending between the flat plate portion and the sidewall portion (Fig. 5, 14a).

Regarding Claim 18: Chen et al teach that inner shape of the dielectric top plate unit 120 is bell-jar type (Fig. 14a).

Regarding Claim 19: Kazumi et al teach gas injection opening 29 for supplying gas into the chamber along the side wall portion (Fig. 3).

Regarding Claims 20, 14: Chen et al teach that an outer periphery of side wall portion 120b is covered with a conductor 124 (metal wall of the chamber) without any gap (Fig. 5, 14a).

Regarding Claim 13: Kazumi et al teach a gap 25 between the side wall portion 23 and the conductor 20 (chamber) [Fig. 3 and para. 0023].

Regarding Claim 22: Chen et al teach the thickness of the side wall portion is smaller than that of the flat plate portion (Fig. 14a). Further, as already explained above under claim 1, geometry (inc. thickness) of the dielectric top plate is optimized as per requirement of microwave electric field distribution in various regions of the processing chamber and also as per required microwaves modes (col. 8, lines 50-68 and col. 12, lines 60-68 and col. 15, line 44 to col. 16, line 25).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rakesh K. Dhingra whose telephone number is (571)-272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Rakesh K. Dhingra

Karla Moore
Primary Examiner
Art Unit 1792